

Why go “above and beyond” to collect defensible VI data?

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Greater Certainty!



Citizen

- Protect health
- Protect property value
- Gain peace of mind



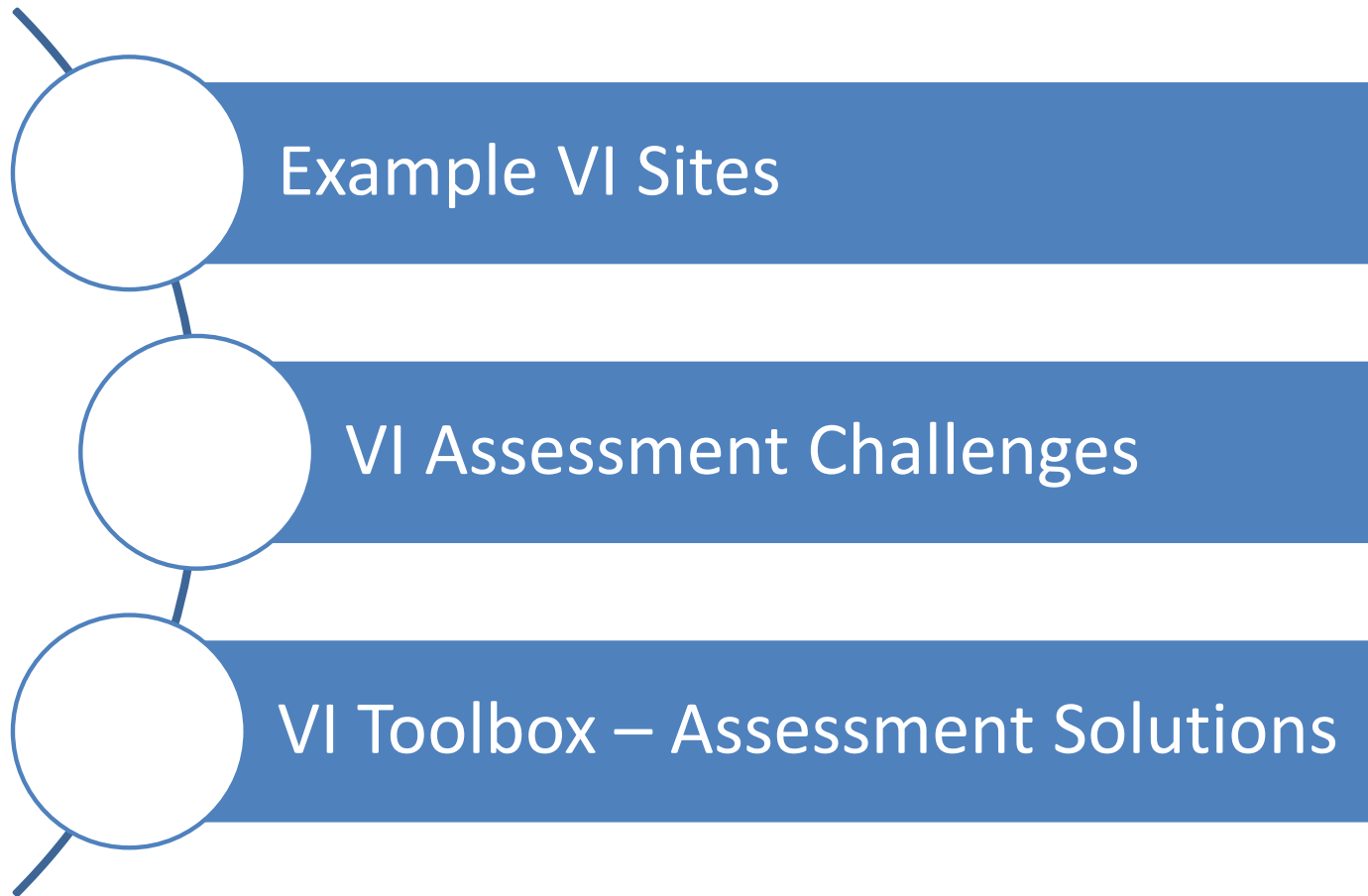
Regulator

- Protect human health and the environment
- Advance the science
- Better estimate program funding



Industry

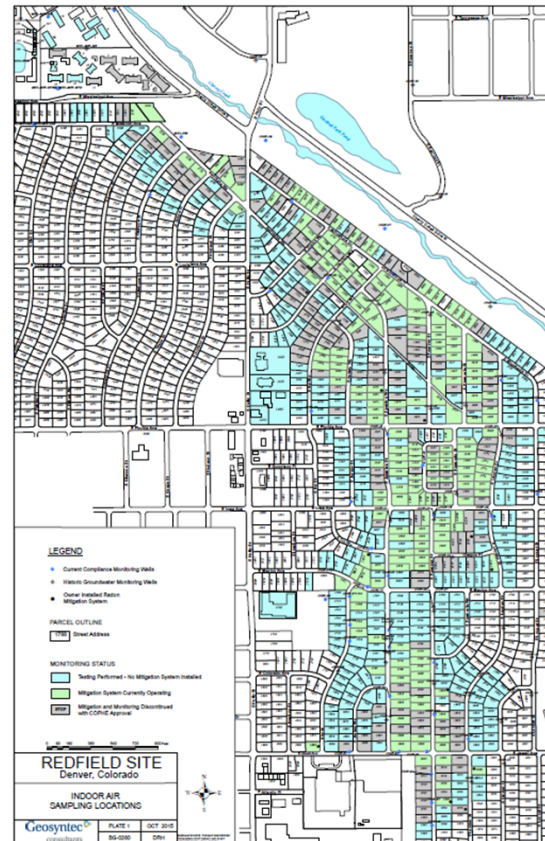
- Protect worker health
- Limit future liability
- Better estimate environmental reserves



Large Industrial Sites (examples)

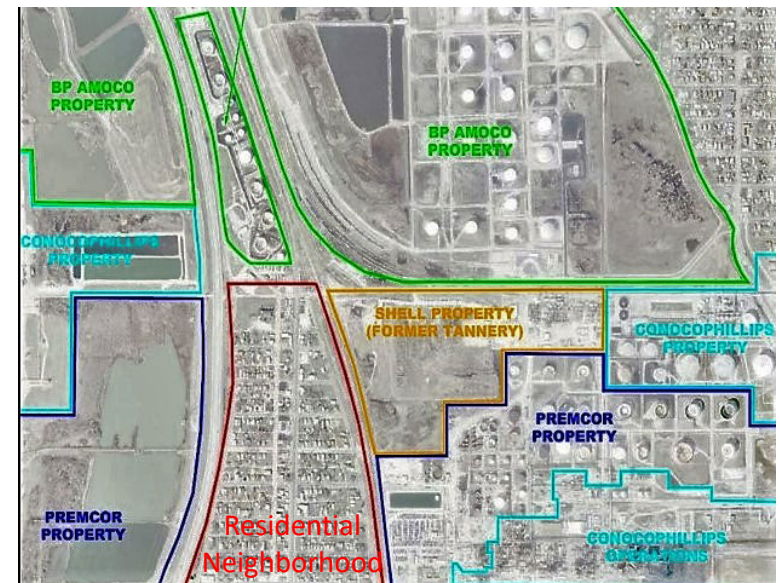
Brown and Redfield Rifle Scopes, Inc. – Denver, CO

- Manufacturing operations caused CVOC groundwater contamination under neighborhood
- Tested more than 719 homes and installed remediation systems in 372 homes to date
- Class action settlement for annoyance, discomfort and loss of use and enjoyment of property
- Committed and responsive cleanup response led to rapid assessment and mitigation, as well as positive relationship with community



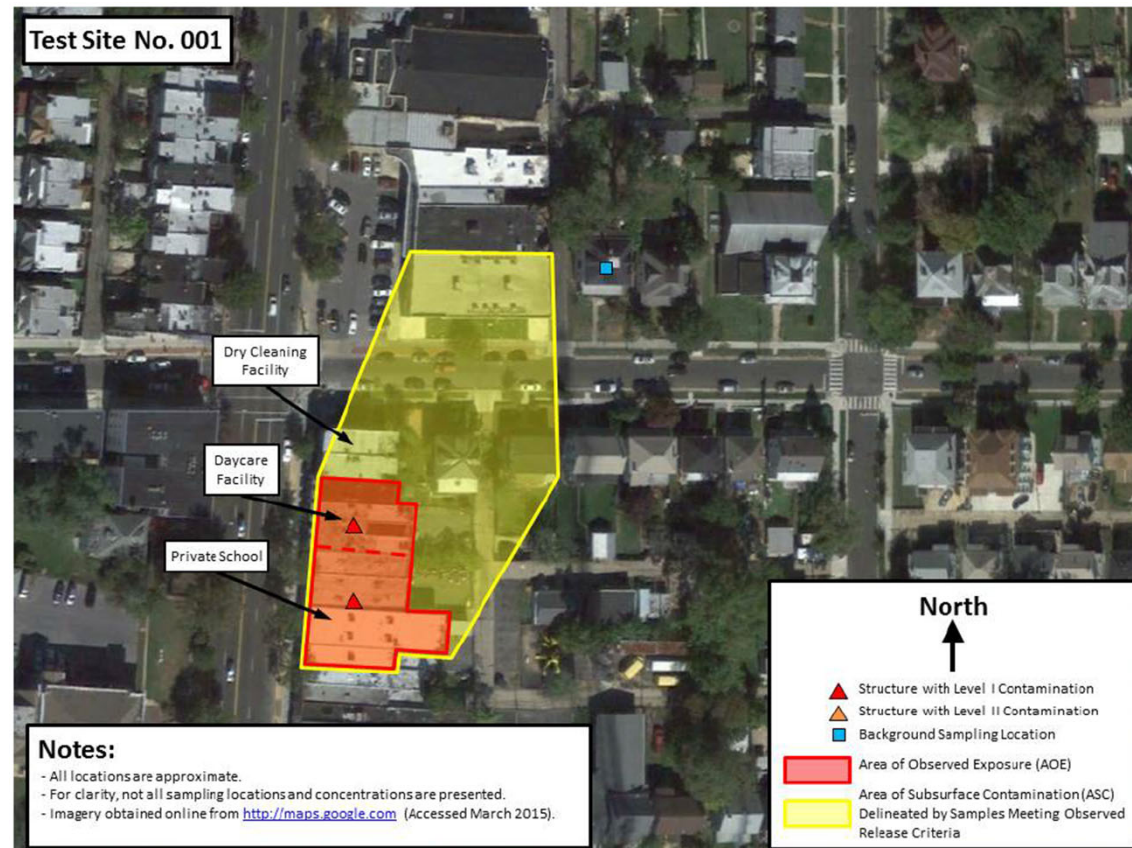
Shell & Premcor – Hartford, IL

- Petroleum VOCs under neighborhood surrounded by refineries, pipelines, etc.
- Large class action settlement for emotional distress and medical monitoring for residents and property owners from 1984 through 2008



Small Commercial Site (example)

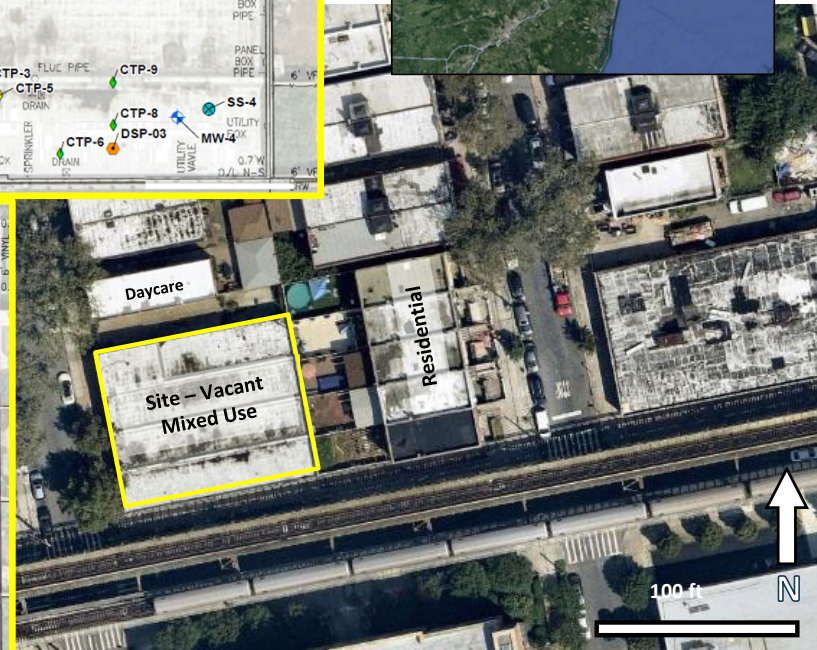
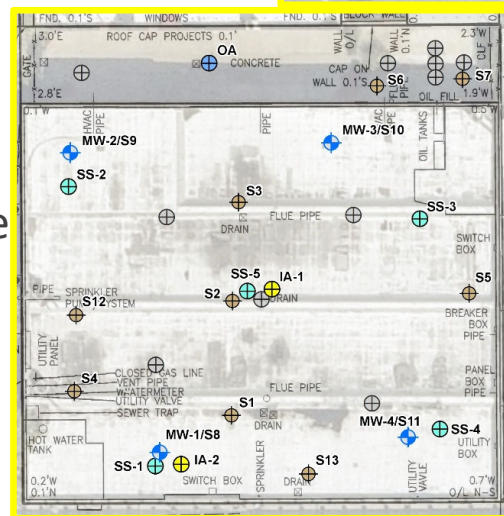
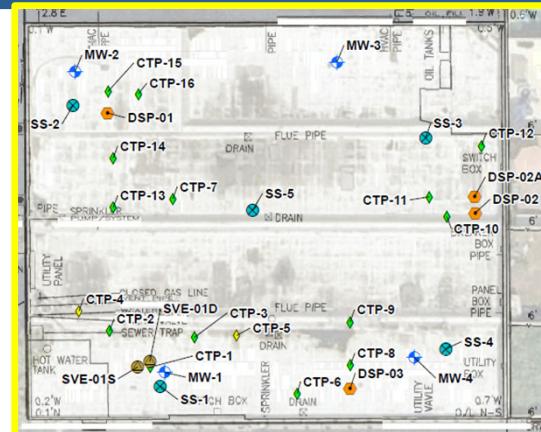
- Active Dry Cleaner – Washington, D.C.
 - Chlorinated solvents release from operating drycleaner adjacent to a daycare and a private school
 - Documented exposure in indoor air of PCE in drycleaner, day care, and school (sensitive populations)
 - Additional contamination observed in subslab samples collected in several additional residential and commercial buildings



Unknown Source (small site redevelopment example)

- Small Commercial Redevelopment – Brooklyn, NY

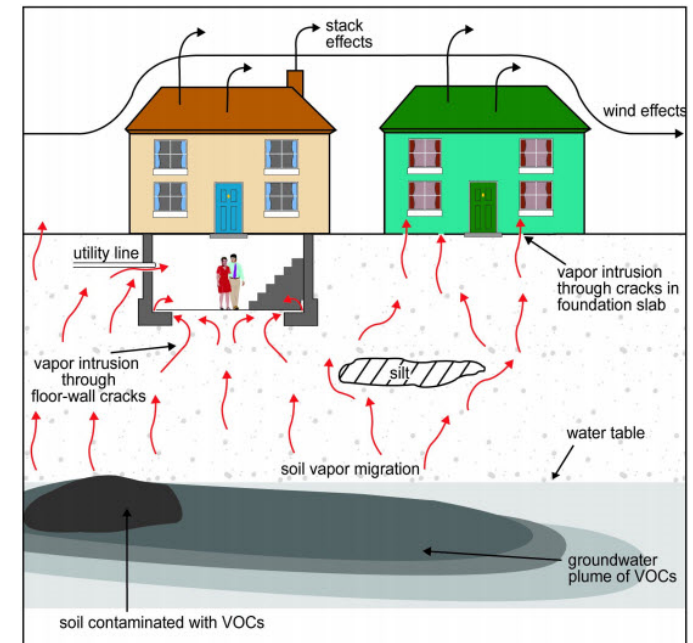
- No obvious source from historical operations
- Aggressive site characterization for a small area; unable to identify source
- Moderate on-site CVOC concentrations in subslab vapor requiring mitigation
- Indoor air exposures above TCE action level in daycare
- Proposed SVE to north of site to “pull back” plume



VI Assessment Challenges

- Temporal and Spatial Variability
- Background and Ambient Chemical source
- Preferential and Conduit VI Pathways
- Sensitive or Disadvantaged Populations
- Timeframe and Assessment Window
- Prioritizing Buildings for Assessment

Ultimate goal: how do you know you captured RME?



Defining and refining the VI CSM

VI Assessment “Solutions” - Overview

- Technologies and strategies can **substantially reduce the risk of false positive and false negative** determinations of whether exposure point concentrations exist
- There is no single technology or strategy that is the best choice for every site assessment – but 1-4 rounds of 24-hr Summa samples is rarely ideal
- Well-established tools that can improve some assessments include:
 - Building pressure cycling (**BPC**)/controlled pressure method (CPM)
 - High volume sampling (**HVS**)
 - Field portable GC/MS systems and real-time on-site continuous GC systems (**HAPSITE**)
 - Long-term passive samples (e.g., **WMS**)
 - Use of indicators & tracers to help schedule VOC sampling or interpret results (e.g., **pressure, radon**)
 - Desktop analyses (e.g., compound-ratio analysis)



Achieve Project-Specific Goals



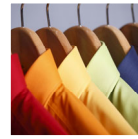
Goal: Reduce Temporal Variability

- BPC
- Quantitative passive sampling
- Differential Pressure
- Radon



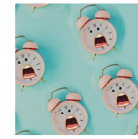
Goal : Reduce Spatial Variability

- HVS
- BPC
- Portable GCMS



Goal: Identify Background Sources or preferential pathways

- Portable GCMS
- BPC
- Compound ratio analysis



Goal: Conduct Investigation in Rapid Timeframe

- BPC
- HVS
- Portable GCMS

ALL help capture RME

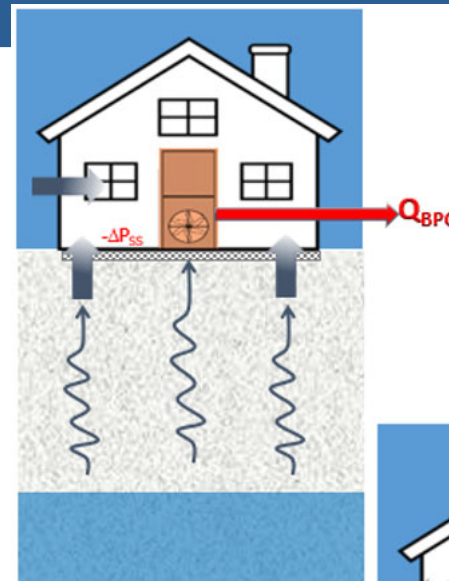
Building Pressure Cycling (BPC)



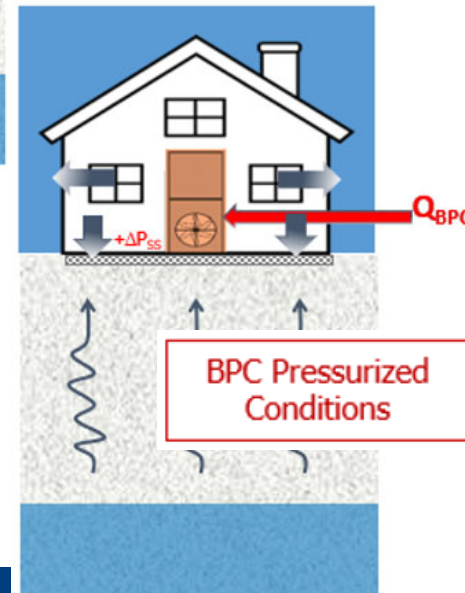
- Induce **depressurized building conditions** and sample to characterize **VI impacts**



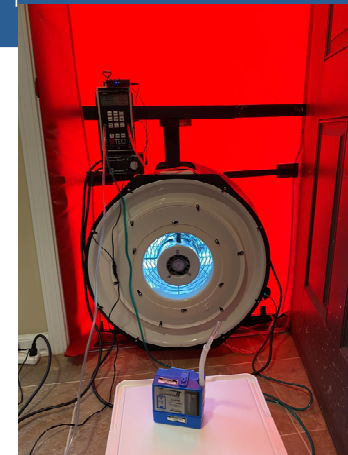
- Induce **positive pressure building conditions** and sample to characterize **background source emissions**.



BPC Depressurized Conditions



BPC Pressurized Conditions



Benefits of BPC

Reduced Spatial Variability

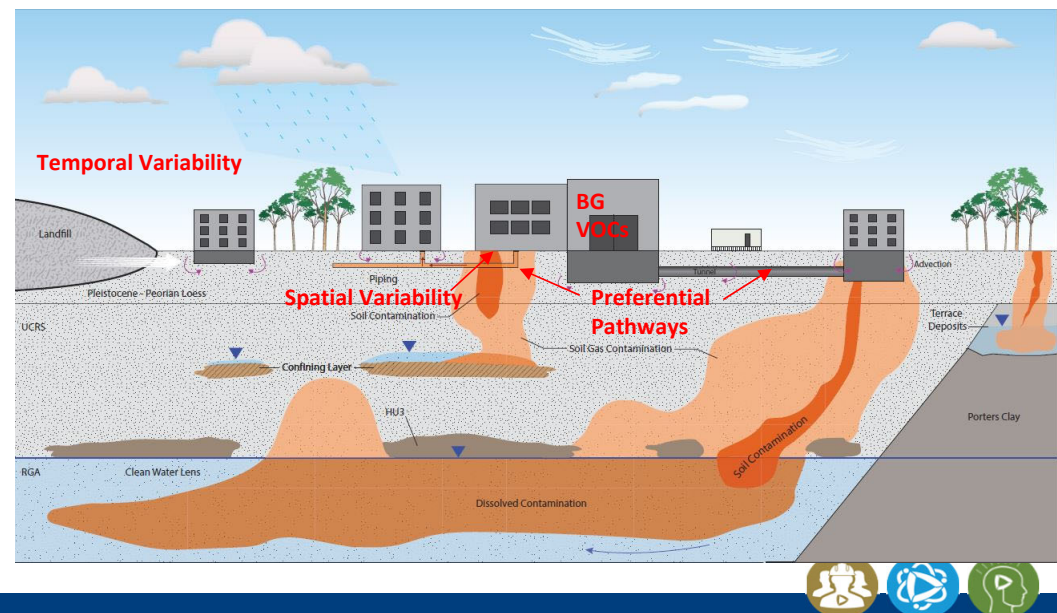
- Integration of IA through single discharge (fan)
- SS depressurization, draw vapors through potential cracks or preferential pathways

Reduced Temporal Variability

- Simulate pressure worst-case to account for all weather conditions
- Depressurized results found to vary less than 2x

Identify Background Sources

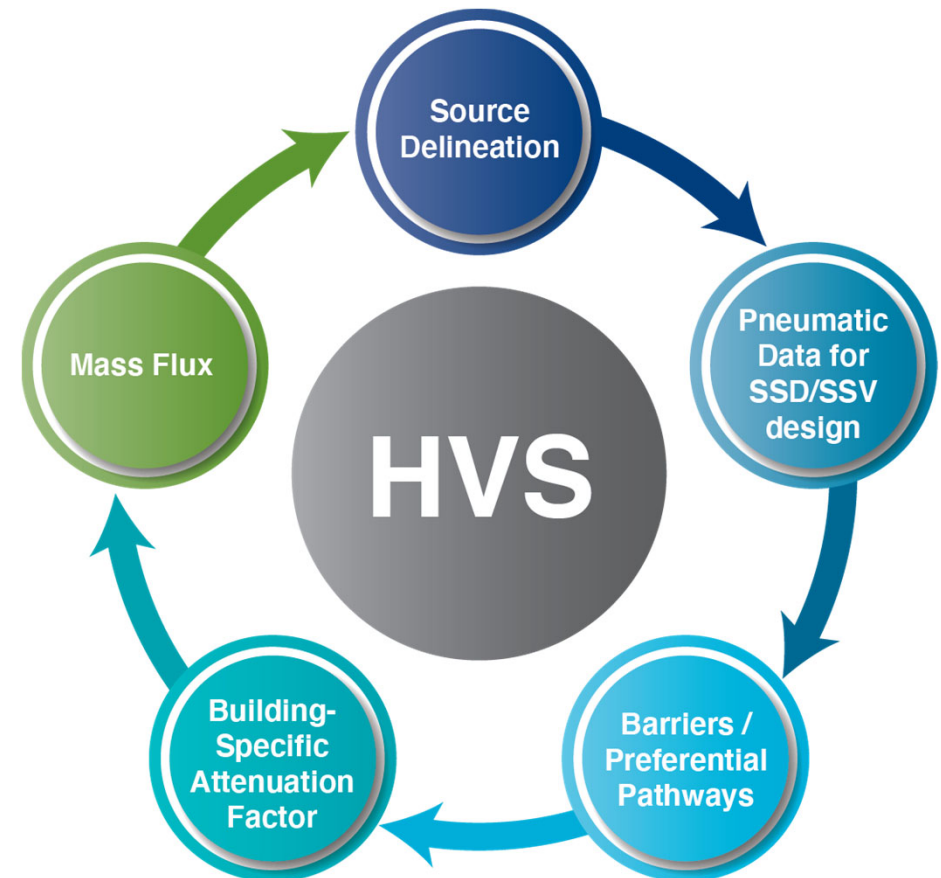
- Sample VOCs in IA under pressurized conditions (VI “turned off”) to estimate background



High Volume Sampling (HVS)

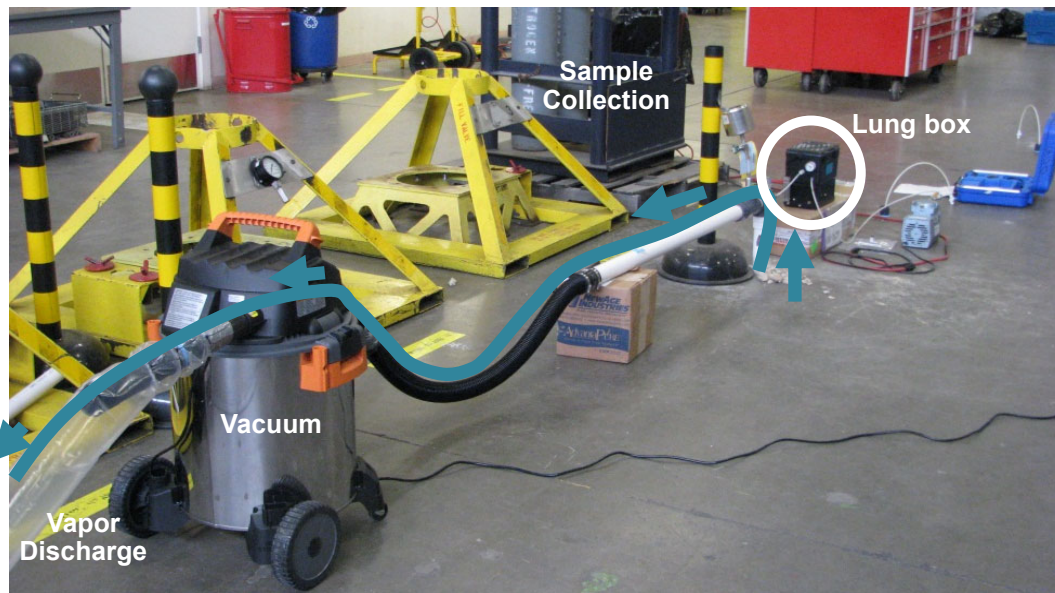
A “Multi-Tool” approach

- Clarify source geometry
- Demonstrate absence of sources
- Minimize risk of failing to identify significant source
- Collect mitigation design parameters

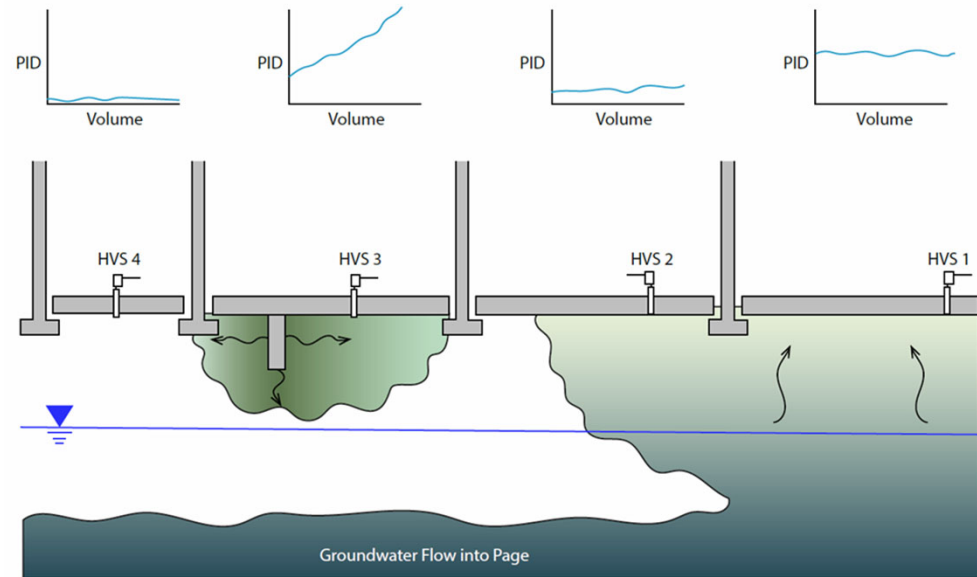


High Volume Sampling (HVS)

Set-up:



Relating Field Data to Source Geometry:



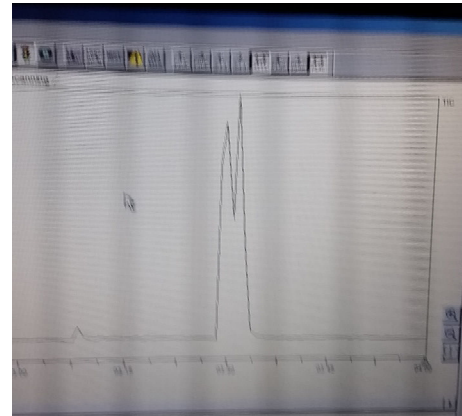
Field portable GC/MS systems and real-time on-site continuous GC systems



Indoor air screening



Preferential Pathways



Identification of Background Sources



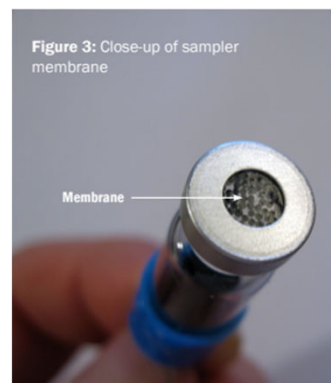
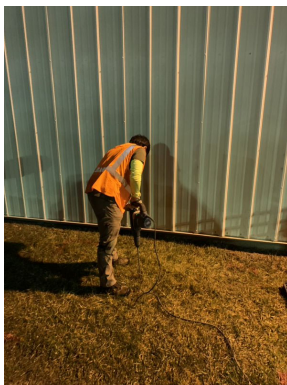
Flux Chamber screening



Quantitative Passive Samplers

Advantages of passive sampling compared to conventional active sampling methods (e.g. Summa canisters)

- Lower cost
- Simpler sampling protocols
- Lower reporting limits without a premium price
- Longer time-integrated samples
- Very small size (discrete to deploy and easy to ship)



Indicators and Tracers

- Increase the likelihood of capturing RME

Indicator: Differential Pressure



Tracer: Radon

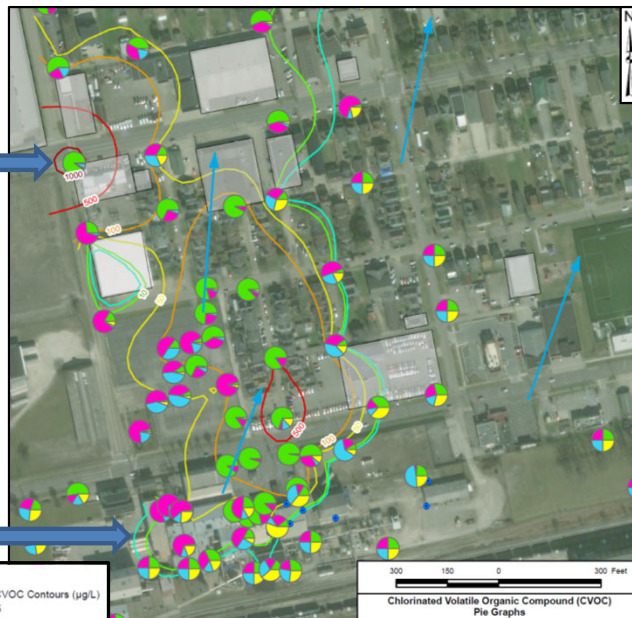


Desktop Analyses – Compound Ratio Analysis

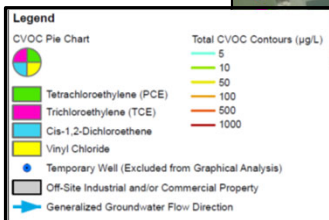
Spatial Comparison

Between Mediums (Attenuation Factor)

Ratio shift –
identification
of source
unrelated to site



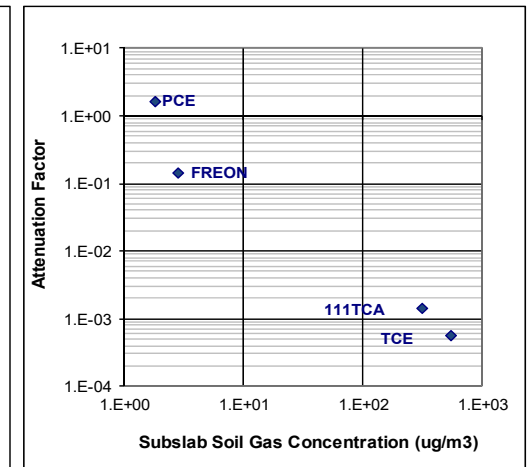
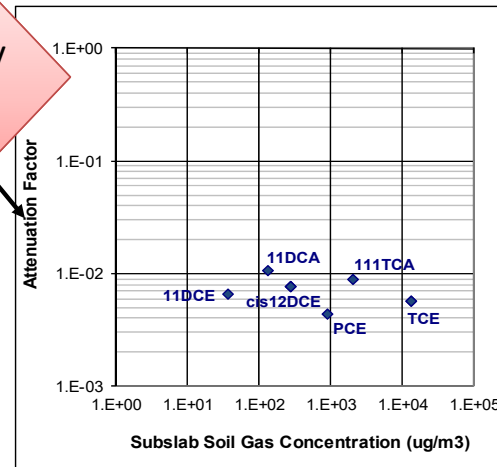
Site



Minimal Influence
on Indoor Air
from Background VOCs

Substantial Influence
on Indoor Air
from Background VOCs

IA/
SS



Takeaways

- Going “above and beyond” to collect more defensible data can be a win-win-win for citizens, regulators and industry
- Many of the techniques are inexpensive and easily implemented as additional lines of evidence to traditional sampling
 - Differential pressure monitoring
 - Radon monitoring
 - Desktop compound ratio analysis
- Based on project circumstances, BPC, HVS, portable GCMS, and/or passive sampling may be quicker and/or more cost effective than traditional methods
- ALL help capture RME and increase confidence in decision making



Thank you!

Questions?



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Geosyntec Profile



Linked In Profile

